

A New *Elysia* (Opisthobranchia: Ascoglossa) from the Florida Keys

by

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Abstract. *Elysia cornigera* sp. nov. from the southern Florida Keys is described. This species is found in sheltered, shallow water, feeding on *Acetabularia crenulata*. It lays between 77 and 137 eggs in a colorless spiral mass on the corona superior of *A. crenulata*. In appearance, *E. cornigera* is small and warty; the body is white to olive green, with small brilliant red and pale orange granular spots, as well as bright green intestinal diverticula, visible through the colorless epidermis. The animal has large warty rhinophores that are swept forward, resembling horns. The teeth of *E. cornigera* are long and narrow, tri-keeled, bi-serrated, and up to 216 μ m long.

INTRODUCTION

Ten species of *Elysia* are currently known from Florida (JENSEN & CLARK, 1983; MARCUS, 1980). Most feed on green siphonate algae in relatively shallow water. A few specimens of a suspected new species were collected by Joyce G. Nuttall in very shallow water on the Florida Bay side of Long Key on 23 July 1986. These animals were associated with *Acetabularia crenulata* Lamouroux, an alga until now with no known Floridian ascoglossan predator. Based on morphology, dentition, developmental data, and ecological data, I propose the following taxon:

Family ELYSIIDAE

Genus *Elysia* Risso, 1818

Elysia cornigera Nuttall, sp. nov.

Type material: The holotype (USNM 859144) and five paratypes (USNM 859145) from West Summerland Key have been deposited at the National Museum of Natural History, Smithsonian Institution.

Type locality and distribution: Following the initial collection of five animals at Long Key, 26 specimens were collected at the southwestern end of West Summerland Key (24°39.7'N, 81°18.1'W). *Elysia cornigera* has been found only on the Florida Bay side of Long Key, West Summerland Key, and Sugarloaf Key. The type locality is Spanish Harbor at West Summerland Key on and around *Acetabularia crenulata* in very shallow, sheltered water on hard substrata (rock or sand over rock).

Diagnosis: Species small (to 8 mm); very warty; general white to olive green appearance with brilliant red and pale orange spots over most of the body; epidermis transparent and colorless; bright green diverticula evident, especially between parapodia; one or two pairs of dorsal parapodial extensions; rhinophores robust at base but tapering to a smooth point, often held in forward position resembling bull's horns; penis bent, below right eye, up to 1 mm long, and unarmed; renopericardium short, with two major dorsal vessels connecting posterolaterally, then branching both anteriorly and posteriorly; teeth slender, tri-keeled, and bi-serrated, to 216 μ m long; head large, in small specimens up to 40% of total body length (Figures 1, 2).

Description: Although with the unaided eye *Elysia cornigera* appears to be dirty white, with a lens many bright colors can be seen (Figure 3). The outer epidermis is clear and colorless, with all the animal's color originating from deeper structures. The white appearance is due to small, white granules 15 μ m in diameter that cover the entire animal. Additionally, larger white granules 46 μ m in diameter are grouped in small clusters around blind ducts along the base of the parapodia. Brilliant green intestinal diverticula enter all parts of the body, including the head and rhinophores, and are occasionally seen through the transparent epidermis between the small, white granules. These diverticula, each about 30 μ m across, branch off larger main ducts. Red granules, 45 μ m in diameter, are located just below the epidermal surface and, although found over most of the body, are usually concentrated on the head, rhinophores, and outer surface of the parapodia.



Explanation of Figures 1 and 2

Figure 1. *Elysia cornigera* sp. nov. (lateral view) on *Acetabularia crenulata* showing hornlike appearance of rhinophores and parapodial extensions. Bar = 1 mm.

Figure 2. *E. cornigera* (dorsal view). Note slender, forward-

swept tips of the rhinophores and general warty appearance. Inset: Inrollment of the rhinophores (ventrolateral view). Bar = 1 mm.

These red spots vary in number from zero to nearly a hundred per animal, with a dozen or two being common. Pale translucent orange vesicles lie somewhat deeper under the epidermis than the red spots and are always larger, up to 80 μm in diameter. These orange spots are restricted to the outer surface of the parapodia and the sides of the foot. The orange and red spots are not associated with vessels or other structures. Finally, around the oral lobes are small, black spots that create a typical elysioid "moustache," as in *E. subornata* Verrill, 1901.

The renopericardium is short, with two main vessels leaving laterally and proceeding lateroposteriorly (Figure 4). Between the dorsal vessels, at the base of the parapodia, lie many yellowish glands. From a previously frozen specimen, these glands are ovoid, about 540 μm long, and yellow-cream colored on one end, while the other end is more colorless. A duct, attached to the colorless end, travels a short distance and is surrounded by a cluster of smaller (80 μm), colorless saclike vessels. Under high magnification, these small, colorless vessels appeared to contain sperm: thus the entire structure is part of an ovotestis network. The mucous gland is behind and to the right of the head, and in a thawed specimen, the gland swelled with water to distort the entire animal.

Egg masses, about 2 mm in diameter, are laid on either the upper or lower surface of the cup (corona superior) of *Acetabularia crenulata*. Each egg spiral contains from 77 to 137 eggs. Capsule size and volume and egg size are given in Table 1. When first deposited, the capsular cytoplasm is opaque, but clears within 10 to 15 min. An extra-capsular ribbon of clear, colorless, refractile yolk winds around the egg case. The uncleaved egg is about 105 μm in diameter (Table 1). The embryo grows to 225

μm in length in the encapsulated veliger stage. The veliger shell possesses a distinct extension at the aperture (Figure 5). Unfortunately, as the veligers began resorbing the velar lobes the egg mass died. No animals were seen hatching, but Type 2 or 3 (metamorphic) (BONAR, 1978) development is predicted.



Figure 3

Camera lucida drawing showing color distribution. Solitary black spots = red spots; outlined spots = orange spots; stipling = green diverticula. Remainder of animal is white. Bar = 1 mm.



Figure 4

Camera lucida drawing of an animal with parapodia held open with a round coverslip. Renopericardium (a) and visible portions of ovotestis (b) are shown. Bar = 1 mm.

Table 1

Character comparison between *Elysia cornigera* sp. nov. and *E. timida*. A = CLARK & JENSEN, 1981; B = BOUCHET, 1984; C = THOMPSON & JAKLIN, 1988; D = ROS & RODRIGUEZ, 1985; “?” = cannot determine from available information.

	<i>E. cornigera</i>	<i>E. timida</i>	Refer- ences
Egg diameter (μm)	105	120	A
Egg volume (mm ³)	61 × 10 ⁻⁵	90 × 10 ⁻⁵	A
Capsule dimensions (μm)	291 × 268	300 × 200	A
Capsule volume (mm ³)	1097 × 10 ⁻⁵	626 × 10 ⁻⁵	A
Appearance	warty	smooth	B, C, D
Rhinophore shape	pointed	blunt	B, C, D
Orange spots	present	absent	B, D
Red spots	small	large	B, C, D
Teeth	tri-keeled, bi-serrated	? ?	





Explanation of Figures 7 and 8

Figure 7. Lateral view of tooth of *Elysia cornigera* showing serrated keel. Bar = 10 μ m.

Figure 8. Lateral view of tooth of *E. cornigera* showing non-serrated keel. Bar = 10 μ m.

Explanation of Figures 5 and 6

Figure 5. Veliger shell of *Elysia cornigera*. Bar = 20 μ m.

Figure 6. Radular tooth of *E. cornigera* showing the tri-keeled, bi-serrated, cutting surface. Bar = 2 μ m.

The buccal mass contains 2–5 ascending and 6 or 7 descending teeth, with over a dozen juvenile teeth heaped in the ascus. Teeth are long and narrow, typically 117–160 μm long (but up to 216 μm), with a tri-keeled, bi-serrated cutting edge (Figure 6). The serrated lateral keel is long and contains denticles that point forward (Figure 7). The unserrated lateral keel is short and smooth (Figure 8). Between the cutting edges the surface is deeply concave (Figure 6). The dorsal notch is broad to accommodate the preceding tooth.

Ecology: *Elysia cornigera* is closely associated with *Acetabularia crenulata*, which grows mainly in very shallow (<40 cm) water. Many animals were collected crawling over stones containing filamentous green algae up to 4 m from the nearest macroalgae. As the standing crop of *A. crenulata* was declining (compared to previous months), *E. cornigera* may have been exploiting other food sources.

Elysia cornigera feeds upon *Acetabularia crenulata* by puncturing utricles one or two at a time and sucking the sap out. Although no detailed observations of feeding behavior were made on this alga (because the mouth was typically obscured by the animal itself or by the alga), radular puncture marks were seen on utricles recently fed on. One animal was observed feeding on a small, filamentous alga. The animal moved slowly, maintaining a hunched appearance as it examined the alga with its oral lobes, pierced the alga with its leading radular tooth, and quickly sucked the contents out. Fecal material was ejected from the anus simultaneously with the pumping of algal sap into the buccal mass. This phenomenon was also observed while *Ercolania fuscata* (Gould, 1870) was feeding on *Bryopsis plumosa* (Hudson) C. Agardh—a steady stream of fecal egesta was released as long as feeding continued. When feeding stopped, only an occasional fecal pellet was released.

Etymology: The specific name is taken from the Latin *corniger* meaning “horned.”

DISCUSSION

Elysia cornigera can easily be distinguished from all western Atlantic elysiids by its unique teeth, general appearance, and ecological habitat. The best external characters for species identification are warty, tapering rhinophores, red and orange spots, colorless epidermis containing white granules, and parapodial extensions. This species occurs in warm, shallow water and feeds on *Acetabularia* sp. No other *Elysia* sp. in the Caribbean has been found in this habitat.

Some physical and ecological characteristics of *Elysia cornigera*, while unique in the Caribbean Sea, are found in elysiids from other parts of the world. In Guam *E. mercieri* (Pruvot-Fol, 1930) (CARLSON & HOFF, 1978) has similar long, warty, pointed rhinophores, white dots cov-

ering the body, and projections above the parapodial margin. Although these parapodial projections are branched and represent true projections rather than just extensions of the parapodial margin, they occur in precisely the same locations as the pointed parapodial extensions of *E. cornigera*.

The closest apparent relative of *Elysia cornigera*, *E. timida* Risso, 1818, occurs in the Mediterranean Sea. *Elysia timida* is similar to *E. cornigera* in coloration, rhinophore shape, dorsal venation, parapodial shape, and diet (SWENNEN, 1961; BALLESTEROS, 1979; SCHMEKEL & PORTMAN, 1982—see fig. 7.94, which is mistakenly labelled *E. viridis* (Montagu, 1804), but is actually *E. timida* [BOUCHET, 1984]; ROS & RODRIGUEZ, 1985; THOMPSON & JAKLIN, 1988). However, several important characters of *E. cornigera* are absent in *E. timida*, such as epidermal warts, orange spots, parapodial extensions, and a tri-keeled, bi-serrated tooth (Table 1).

The leading tooth of *Elysia cornigera* is less delicate than the tooth of *E. timida* pictured by BOUCHET (1984). The tip of the leading tooth of *E. cornigera* is pointed like that of *E. timida* (BOUCHET, 1984), but older teeth in the descending radula are blunt-tipped, as drawn by SWENNEN (1961). The base of the tooth in *E. cornigera* is squared, as that of *E. timida* pictured by SWENNEN (1961) rather than pointed (BOUCHET, 1984). Other similar characteristics may be found when the three-dimensional structure of more elysiid radular teeth is investigated by scanning electron microscopy. Lateral views of radulae seen in slide mounts often obscure this particular aspect of the teeth. It is easy to understand how the teeth of *E. timida* pictured by SWENNEN (1961), BOUCHET (1984), and THOMPSON & JAKLIN (1988) can look so different.

Similarities between *Elysia cornigera* and *E. timida*, such as morphology and diet, suggest that these species may be evolutionarily close. A genetic comparison between these species, as well as among other Atlantic ascoglossan species, would help estimate evolutionary relationships in the Atlantic Ascoglossa. Among Caribbean ascoglossan species, electrophoretic techniques show large genetic distances between species and reveal unsuspected sibling species. *Elysia cornigera* is genetically distinct from other Caribbean elysiids; it has a Nei's genetic identity of 0.37 when compared (at 11 loci) with other species in its clade: *E. tuca* Marcus, 1967, *E. papillosa* Verrill, 1901, *E. sp.* (an undescribed species that is morphologically similar to *E. papillosa*), and *E. serca* Marcus, 1955. The genetic dissimilarity is greater when comparing *E. cornigera* with the other two members in its clade, *E. (Tridachia) crispata* Morch, 1863, and *E. patina* Marcus, 1980, and to a subornata clade containing *E. subornata* and two undescribed species (Nuttall, unpublished data). The Caribbean Sea shares many ascoglossan species with the eastern Atlantic Ocean and the Mediterranean Sea; thus a genetic comparison between amphiatlantic populations would indicate whether sibling status is needed for some species.

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